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BIOGRAPHY.

HOÜEL.

BY GEORGE BRUCE HALSTED.

GUILLAUME JULES HOÜEL, of a very old protestant family of Normandy, was born at Thaon (Calvados) on April 7th, 1823, and died at Périers, near Caen, June 14th, 1886.

The key to his whole mental life was this old protestant blood, which means so much in a Roman catholic country.

After studying at the lyceum of Caen, and the college Rollin, he entered the great Normal School of Paris in 1843. On leaving, he taught at Bourges, Bordeaux, Pau, Alençon and Caen.

In 1855 he took his Doctor's degree at the Sorbonne, and then, declining the overtures of Le Verrier to join the working force at the Observatory, he retired to his home at Thaon to continue his researches. In 1859 he was called to succeed Le Besgue in the chair of pure mathematics of the Faculty of Sciences of Bordeaux. Here he found dignity and facilities for work, and considered the position as final.

The idea of duty was the essence of his character, remarkably sweet and even. Not only in his official position did he forward science, he spread it with profusion all around him.

So precise and rigorous was his mind that he scorned Legendre's and Clairant's geometries, and the conventional neatness of the French texts, in favor of the eternal geometer Euclid.

In 1863 he published at Greifswald an essay on the fundamental principles of geometry. In this he has already reached by himself the idea that a demonstration of the postulatum of Euclid is impossible. He says: "Since long, the scientific researches of mathematicians on the fundamental principles of elementary geometry have concentrated themselves almost exclusively on the theory of parallels; and if, hitherto, the efforts of so many eminent minds have produced no satisfactory result, it is perhaps permitted to conclude thence that in pursuing these researches they have followed a false path and attacked an insoluble problem, of which the importance has been exaggerated in consequence of inexact ideas on the nature and origin of the primordial verities of the science of space."

To the mind so self-prepared came an important communication in 1866 from Dr. R. Baltzer informing Hoüel of the fundamental idea of Lobachévski and Bolyai and announcing that Baltzer would mention it in the forthcoming second edition of his Elements of Geometry. That very year 1866 Hoüel issued his translation of Lobachévski's "Geometrische Untersuchungen zur Theorie der Parallellinien," and in the preface to his translation quotes from W. Bolyai's "Kurzer Grundriss eines Versuchs etc.," and mentions the work of J. Bolyai with date 1832. In this preface he says: "The aim of the author is to prove that there exists *à priori* no reason to affirm that the sum of the three angles of a rectilineal triangle is not less than two right angles, or, what comes to the same thing, that one cannot draw, through a given point more than a single straight not meeting a given straight in the same plane.

In spite of the high value of these researches, they have not hitherto drawn the attention of any geometer. We do not believe however that we exaggerate their philosophic import in saying that they throw a new day on the fundamental principles of geometry, and that they open a path yet unexplored capable of leading to unexpected discoveries. Not to go beyond elementary questions, one cannot deny that they accomplish an immense advance in methods of teaching by relegating among the chimeras the hope still nourished by so many geometers of demonstrating the postulatum of Euclid.

Henceforth these attempts must be ranked with the quadrature of the circle and perpetual motion."

He mentions the assumption, (three points are costraight or concyclic), given by W. Bolyai to replace Euclid's·

A translation of J. Bolyai was delayed until 1868 by Hoüel's inability to procure a copy of the now celebrated Appendix. How this difficulty was fortunately overcome I learned while in Hungary where my friend Franz Schmidt entrusted to me a precious file of Hoüel's own letters. From these letters it appears that a copy of Hoüel's 'Essai' of 1863 having come by chance into the hands of a young architect of Temesvár in Hungary, this youth (Franz Schmidt), desirous of continuing his mathematical studies wrote for counsel to Hoüel. Hoüel had answered helpfully, and later implored the aid of Schmidt to procure Bolyai's work, and besought Schmidt to collect what materials he could for a biography. This Schmidt did, and his article on Grunert's Archiv, 1868, remained, until my own researches and my journey to Hungary, the only source of information on these wonderful Magyars. Schmidt succeeded in procuring for Hoüel two copies of Bolyai's work. One Hoüel proceeded to translate himself; the other he sent to Battaglini, asking him to make known in Italy this wonderful idea. This he did by an Italian translation. Thus to Hoüel belongs a perfectly definite and permanent place in the final history of human thought.

Much else he did; so much that I could not attempt to enumerate it in the brief space at my disposal here. Fortunately it has been most sympathetically done by M. G. Brunel in a book of 78 pages most obligingly furnished me by Hoüel's son-in-law, Monsieur H. Barckhausen.

M. Brunel cites on page 34 my Bibliography of Hyper-Space and Non-Euclidean Geometry (1878), and also that published at Kiev in 1880 by Vashtchenko-Zaharchenko, but omits to state that this latter was simply a reprint of mine with slight additions, as is also that given at the end of the Kazan edition of Lobachévski's Works, 1886. Some grotesque effects are produced by reprinting or attempting to reprint my English. Thus under P. G. Tait the title of the work is given as follows: "Mentions Hyper-Space in his Address as Pres. of Math. Sect. of Brit. Assoc. at Edinbvrgh." Under G. P. Young we read "The relation which can be proved to subsist between the Area of a Plane Triangle and the Sum of the Hypothesis that Euclid's twelfth Axiom is false." I must take it, from this extraordinary summation of a hypothesis, that English is nearly as difficult as Russian, though neither can for one instant compete with the Magyar.

In his personal character Hoüel reached that perfection which he has done so much to introduce into the foundations of Geometry.

NON-EUCLIDEAN GEOMETRY: HISTORICAL AND EXPOSITORY.

By **GEORGE BRUCE HALSTED**, A. M. (Princeton); Ph. D. (Johns Hopkins); Member of the London Mathematical Society; and Professor of Mathematics in the University of Texas, Austin, Texas.

[Continued from March Number.]

PROPOSITION XXVI. *If the aforesaid AX, BX (fig. 31.) must indeed meet each other, but only at their infinite production toward the parts of the point X: I say there will be no assignable point T in AB, from which a perpendicular erected towards the parts of AX does not at a finite or terminated distance meet this AX in some point F.*

Demonstratur. For (from the preceding hypothesis) there will be in *AX*